What is claimed is:

1 1. A program information transmission apparatus that repeatedly

2 transmits program information with a predetermined cycle,

3 comprising:

4   a storing unit operable to store information showing

5 a transmission amount per unit time, the unit time being shorter

6 than the cycle;

7   a fetching unit operable to fetch the program information

8 in parts so that each fetched part of the program information

9 has a size within the transmission amount per unit time; and

10   a transmission unit operable to sequentially transmit

11 each fetched part of the program information.

1 2. The program information transmission apparatus of Claim

2 1,

3   wherein the information in the storing unit shows,

4 as the transmission amount per unit time, a maximum number

5 of packets that should be transmitted per unit time, and

6   the fetching unit includes:

7   a packet generating unit operable to generate a plurality

8 of packets of a fixed length from program information sets,

9 each of which includes a part of the program information;

10   a holding unit operable to hold the plurality of packets

11 so that packets belonging to different program information

12 sets are held in different queues; and

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13   a packet fetching unit operable to fetch the plurality

14 of packets from the queues in a predetermined order so that

15 a number of packets fetched per unit time does not exceed the

16 maximum number.

1   3. The program information transmission apparatus of Claim

2   2,

3   wherein packets generated from one program information

4   set is divided into at least one section, and

5   the packet fetching unit is controlled to fetch all

6   packets in a current section before fetching packets in another

7   section.

1   4. The program information transmission apparatus of Claim

2   3 further comprising:

3   a calculation unit operable to recalculate the maximum

4   number, each time at least one program information set is updated

5   or is newly registered,

6   wherein the calculation unit includes:

7   a first calculation unit operable to calculate a maximum

8   number for each program information set from a data amount

9   of the program information set and the cycle, each maximum

10 number calculated for one program information set being a maximum

11 number of packets of the program information set that should

12 be transmitted per unit time; and

13   a second calculation unit operable to calculate a total

14   of the maximum numbers calculated by the first calculation

15   unit,

16   wherein the information in the storing unit is

17   overwritten with the total calculated by the second calculation

18   unit.

1   5. The program information transmission apparatus of Claim

2   4,

3   wherein each program information set is assigned a

4   priority, and

5   the packet fetching unit fetches the plurality of packets

6   from the queues according to the priorities assigned to the

7   program information sets.

1   6. The program information transmission apparatus of Claim

2   5,

3   wherein the storing unit also stores each maximum number

4   calculated by the first calculation unit, and

5   the packet fetching unit includes:

6   a cumulative calculation unit operable to, after the

7   packet fetching unit fetches the last packet of a current section

8   in an "n"th transmission period, calculate a cumulative number

9   for a program information set including the current section

10   by multiplying the maximum number for the program information

11   set by "n", each transmission period being a period within

12   the cycle and having a length of the unit time, the cumulative

13 number being a number of packets of the program information

14 set that should be transmitted by an end of the "n"th transmission

15 period; and

16   a selecting unit operable to, if a number of hitherto

17 fetched packets of the program information set is at least

18 equal to the cumulative number, select another program

19 information set assigned a next higher priority as a program

20 information set whose packets are to be fetched.

1 7. The program information transmission apparatus of Claim

2 3 further comprising:

3   an input receiving unit operable to receive an input

4 of immediate program information that should be urgently

5 transmitted;

6   a prohibiting unit operable to prohibit, if immediate

7 program information is inputted, the packet fetching unit from

8 fetching packets;

9   a second packet generating unit operable to generate

10 a plurality of packets of a fixed length from the inputted

11 immediate program information;

12   a transmission control unit operable to control the

13 transmission unit to sequentially transmit all of the packets

14 generated by the second packet generating unit; and

15   a prohibition ending unit operable to instruct, after

16 all of the packets generated by the second packet generating

17 unit are transmitted, the prohibiting unit to end the prohibition

18   operation.

1   8. The program information transmission apparatus of Claim

2   7,

3   wherein the prohibiting unit waits for all packets

4   of a section, which includes a packet fetched immediately before

5   the immediate program information was inputted, to be fetched

6   before starting the prohibition operation.

1   9. The program information transmission apparatus of Claim

2   2 further comprising:

3   an input receiving unit operable to receive an input

4   of immediate program information that should be urgently

5   transmitted;

6   a prohibiting unit operable to prohibit, if immediate

7   program information is inputted, the packet fetching unit from

8   fetching packets;

9   a second packet generating unit operable to generate

10   a plurality of packets of a fixed length from the inputted

11   immediate program information;

12   a transmission control unit operable to control the

13   transmission unit to sequentially transmit all of the packets

14   generated by the second packet generating unit; and

15   a prohibition ending unit operable to perform, after

16   all of the packets generated by the second packet generating

17   unit are transmitted, packet transmission adjustment for a

18 number of transmitted packets exceeding the maximum number

19 of packets that should be transmitted per unit time, before

20 instructing the prohibiting unit to end the prohibition

21 operation.

1 10. The program information transmission apparatus of Claim

2 9,

1   wherein the prohibiting unit waits for all packets

2 of a section, which includes a packet fetched immediately before

3 the immediate program information was inputted, to be fetched

4 before starting the prohibition operation, and

5   the prohibition ending unit waits for a number of packets,

6 whose transmission is refrained after all packets generated

7 by the second packet generating unit are transmitted, reaches

8 a number of transmitted packets exceeding the maximum number

9 of packets that should be transmitted per unit time, before

10 instructing the prohibiting unit to end the prohibition

11 operation.

1 11. A program information transmission apparatus that

2 repeatedly transmits program information with a predetermined

3 cycle, comprising:

4   a storing unit operable to store information showing

5 a maximum number for each transmission period that is a period

6 within the cycle and has a length of a unit time shorter than

7 the cycle, each maximum number for one transmission period

8   being a number of packets that should be transmitted in the

9   transmission period;

10   a packet generating unit operable to generate a plurality

11   of packets of a fixed length from program information sets,

12   each of which includes a part of the program information;

13   a holding unit operable to hold the plurality of packets

14   so that packets belonging to different program information

15   sets are held in different queues;

16   a fetching unit operable to fetch the plurality of

17   packets from the queues in a predetermined order so that a

18   number of packets fetched in each transmission period does

19   not exceed the maximum number for the transmission period;

20   a transmission unit operable to sequentially transmit

21   each fetched packet;

22   a calculation unit operable to recalculate each maximum

23   number, each time at least one program information set is updated

24   or is newly registered,

25   wherein the calculation unit includes:

26   a first calculation unit operable to divide a data

27   amount of each program information set by a number of transmission

28   periods within the cycle and set a division result obtained

29   for each program information set as an average number for the

30   program information set without rounding up or discarding a

31   fractional portion of the division result, each average number

32   for one program information set being a number of packets of

33   the program information set that should be transmitted per

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34 unit time;

35   a second calculation unit operable to calculate, for

36 each program information set, a cumulative number of packets

37 of the program information set that should be transmitted by

38 an end of an "n"th transmission period by multiplying the average

39 number for the program information set by "n";

40   a third calculation unit operable to total the cumulative

41 numbers calculated by the second calculation unit; and

42   a fourth calculation unit operable to calculate the

43 maximum number for the "n"th transmission period from the total

44 calculated by the third calculation unit,

45   wherein the information in the storing unit is

46 overwritten with the maximum number calculated by the fourth

47 calculation unit.

1 12. The program information transmission apparatus of Claim

2 11,

3   wherein the second calculation unit adds a predetermined

4 positive value that does not exceed one to each average number,

5 sets each addition result as a new average number, multiplies

6 each new average number by "n", obtains an integer by rounding

7 up each multiplication result, and sets each integer as one

8 cumulative number.

1 13. The program information transmission apparatus of Claim

2 11,

3   wherein packets generated from one program information

4   set is divided into at least one section, and

5   the packet fetching unit is controlled to fetch all

6   packets in a current section before fetching packets in another

7   section.

1   14. The program information transmission apparatus of Claim

2   11,

3   wherein each program information set is assigned a

4   priority, and

5   the packet fetching unit fetches the plurality of packets

6   from the queues according to the priorities assigned to the

7   program information sets.

1   15. The program information transmission apparatus of Claim

2   14,

3   wherein the storing unit also stores each cumulative

4   number calculated by the second calculation unit, and

5   after fetching the last packet of a current section

6   in the "n"th transmission period, the packet fetching unit

7   refers to the information in the storing unit and, if a number

8   of hitherto fetched packets of a program information set

9   including the current section is at least equal to the cumulative

10   number for the program information set, selects another program

11   information set assigned a next higher priority as a program

12   information set whose packets are to be fetched.

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16. The program information transmission apparatus of Claim 11 further comprising:

an input receiving unit operable to receive an input of immediate program information that should be urgently transmitted;

a prohibiting unit operable to prohibit, if immediate program information is inputted, the packet fetching unit from fetching packets;

a second packet generating unit operable to generate a plurality of packets of a fixed length from the inputted immediate program information;

a transmission control unit operable to control the transmission unit to sequentially transmit all of the packets generated by the second packet generating unit; and

a prohibition ending unit operable to instruct, after all of the packets generated by the second packet generating unit are transmitted, the prohibiting unit to end the prohibition operation.

17. The program information transmission apparatus of Claim 16,

wherein the prohibiting unit waits for all packets of a section, which includes a packet fetched immediately before the immediate program information was inputted, to be fetched before starting the prohibition operation.

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1 18. The program information transmission apparatus of Claim

2 11 further comprising:

3   an input receiving unit operable to receive an input

4 of immediate program information that should be urgently

5 transmitted;

6   a prohibiting unit operable to prohibit, if immediate

7 program information is inputted, the packet fetching unit from

8 fetching packets;

9   a second packet generating unit operable to generate

10 a plurality of packets of a fixed length from the inputted

11 immediate program information;

12   a transmission control unit operable to control the

13 transmission unit to sequentially transmit all of the packets

14 generated by the second packet generating unit; and

15   a prohibition ending unit operable to perform, after

16 all of the packets generated by the second packet generating

17 unit are transmitted, packet transmission adjustment for a

18 number of transmitted packets exceeding the maximum number

19 for the "n"th transmission period, before instructing the

20 prohibiting unit to end the prohibition operation.

1 19. The program information transmission apparatus of Claim

2 18,

3   wherein the prohibiting unit waits for all packets

4 of a section, which includes a packet fetched immediately before

5   the immediate program information was inputted, to be fetched

6   before starting the prohibition operation, and

7   the prohibition ending unit waits for a number of packets,

8   whose transmission is refrained after all packets generated

9   by the second packet generating unit are transmitted, reaches

10   a number of transmitted packets exceeding the maximum number

11   for the "n"th transmission period, before instructing the

12   prohibiting unit to end the prohibition operation.

1   20. A program information transmission method of repeatedly

2   transmitting program information with a predetermined cycle,

3   comprising:

4   a packet generating step for generating a plurality

5   of packets of a fixed length from program information sets,

6   each of which includes a part of the program information;

7   a holding step for holding the plurality of packets

8   so that packets belonging to different program information

9   sets are held in different queues;

10   a packet fetching step for fetching, in each transmission

11   period that is a period within the cycle and has a length of

12   a unit time shorter than the cycle, the plurality of packets

13   from the queues in a predetermined order so that a number of

14   packets fetched in each transmission period does not exceed

15   a maximum number of packets that should be transmitted in the

16   transmission period; and

17   a transmission step for sequentially transmitting each

18   fetched packet.

1   21. The program information transmission method of Claim 20,

2   wherein packets generated from one program information

3   set is divided into at least one section, and

4.   the packet fetching step is controlled to fetch all

5   packets in a current section before fetching packets in another

6   section.

1   22. The program information transmission method of Claim 21,

2   wherein each program information set is assigned a

3   priority, and

4   the packet fetching step fetches the plurality of packets

5   from the queues according to the priorities assigned to the

6   program information sets.

1   23. The program information transmission method of Claim 22,

2   wherein the packet fetching step includes:

3   a cumulative calculation step for calculating, after

4   the packet fetching step fetches the last packet of a current

5   section in an "n"th transmission period, a cumulative number

6   for a program information set including the current section

7   by multiplying "n" by a predetermined maximum number of packets

8   of the program information set that should be transmitted per

9   unit time, the cumulative number being a number of packets

10   of the program information set that should be transmitted by

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11 an end of the "n"th transmission period; and

12   a selecting step for selecting, if a number of hitherto

13 fetched packets of the program information set is at least

14 equal to the cumulative number, another program information

15 set assigned a next higher priority as a program information

16 set whose packets are to be fetched.

1   24. A program information transmission method comprising:

2   a receiving step for receiving an input of a program

3   information set;

4   a judging step for judging whether the inputted program

5   information set needs to be urgently transmitted;

6   a packet generating step for generating a plurality

7   of packets of a fixed length from the inputted program information

8   set;

9   a holding step for holding each packet in a queue,

10 if the inputted program information set does not need to be

11 urgently transmitted, packets generated from different program

12 information sets being held in different queues; and

13   a transmission control step for (1) until a program

14 information set that needs to be urgently transmitted is inputted,

15 fetching and transmitting each packet held in a queue in a

16 predetermined order so that a number of packets fetched and

17 transmitted in each predetermined period does not exceed a

18 maximum number of packets that should be transmitted in the

19 predetermined period, and (2) if a program information set

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20 that needs to be urgently transmitted is inputted, terminating

21 a transmission of each packet in a queue and sequentially

22 transmitting all packets generated from the program information

23 set that needs to be urgently transmitted.

1 25. A computer-readable recording medium which records a program

2 information transmission program that has a computer execute

3 a procedure for repeatedly transmitting program information

4 with a predetermined cycle,

5   the program information transmission program

6 comprising:

7   a packet generating step for generating a plurality

8 of packets of a fixed length from each program information

9 set that includes a part of the program information;

10   a holding step for holding each packet in a queue so

11 that packets generated from different program information sets

12 are held in different queues;

13   a fetching step for fetching, in each transmission

14 period that is a period within the cycle and has a length of

15 a unit time shorter than the cycle, each packet from a queue

16 in a predetermined order so that a number of packets fetched

17 in each transmission period does not exceed a maximum number

18 of packets that should be transmitted in the transmission period;

19 and

20   a transmission step for sequentially transmitting each

21 fetched packet.